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Understanding the dynamics of attitudes within a design and business focused collaboration

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Abstract
This paper aims to advance understanding about design's unique contributions within collaborations between the disciplines of design and business. Collaboration between design and business functions is increasingly utilised as organisations seek to capitalise on a variety of knowledge and perspectives during the innovation process. Despite this increasing prevalence, the discipline of design can often be misunderstood by other disciplines within this particular interdisciplinary scenario due to the implicit knowledge that is central to the nature of design, which is often intangible and tacit in nature, yet provides designers with the capability to propose novel solutions to complex problem situations. This paper takes a deeper look at design attitude, which has previously been suggested to be one of the differentiators between design and other disciplines. The paper reflects on the results of a case study focusing on a collaboration between a multinational consumer goods company and a team of postgraduate students working out of a UK University. Data was obtained through observation, a reflective workshop and repertory grid based interviews. The originality of the paper lies in the way in which it categorises attitudes of different disciplines, in order to capture aspects of the design attitude that appear to be both unique and difficult for business focused people to adopt.

Keywords: design attitude, multidisciplinary innovation, design knowledge.

Introduction

Contemporary organisations face complex, open-ended challenges that require leaders to broaden their range of thinking in order to develop strategies capable of dealing with these problems (Stacey *et al.*, 2000). In dealing with these challenges, organisations are frequently turning to multidisciplinary collaborations due to the broader depths of knowledge, resources and perspectives that are capable of enhancing the quality of an organisation's innovation outputs (Reuveni and Vashdi, 2015). Design is often at the core of this process, with organisations looking to implement design thinking methods in order to deal with the challenges offered by open, complex problem situations (Dorst, 2011). Subsequently, design-driven innovation has gained traction within organisational processes, specifically the way in which organisations strive to focus on the radical innovation of meanings as opposed to technology-push or market-pull strategies, which are more traditional modes of innovation (Verganti, 2009). As a result, design thinking can now be viewed as the application of design methods by multidisciplinary teams to a broad range of innovation challenges (Seidel and Fixson, 2013).

Although design can be a driver of innovation within interdisciplinary collaboration, the relationship between design and other disciplines within these types of collaborations is often scrutinised, particularly due to the importance that multidisciplinary collaboration can play in improving the competitiveness of organisations (Baregheh *et al*., 2009). The paper will begin with a discussion of this literature within the context of the relationship between design thinking and business. Next, a summary of design attitude literature will be provided, followed by a description of the research process of the study. The paper will then outline key propositions that are made within the design attitude literature before discussing evidence of these propositions that was observed within the context of a collaborative project where design had to work closely with business and marketing. The wider implications of these findings to both research and practice are then discussed alongside the associated limitations of the research.

The relationship between design and business

Within the context of organisations, design thinking is essentially a human-centred process that emphasises observation, collaboration, fast learning, visualisation of ideas, rapid concept prototyping and concurrent business analysis which ultimately influences innovation and strategy (Lockwood, 2009). Subsequently, design thinking is a way of applying a designer's methods to problem solving, no matter what the problem is. The term design thinking can be traced back to the work of Simon (1955); however it is arguably the writing of Brown (2008) who popularised the term within the context of the management field. Brown (2008) suggested that design thinking is capable of leading to innovation that goes beyond aesthetics and as a result, creates ideas that better meet consumer needs and desires. Consequently, it is theorised that thinking like

a designer can transform the way organisations develop products, services, processes and strategies; which are capable of creating new forms of value to organisations.

Martin (2009) highlights that organisations best equipped to develop design thinking into a competitive advantage are those that have the capabilities to balance the exploration of new knowledge (innovation) and the exploration of existing knowledge (efficiency). On the whole, Martin (2009) indicates that there has been a surge in organisations seeking to implement design thinking methods, however design-thinking organisations remain a small minority. It is suggested that typically, the larger a company, the less likely they are to consider design thinking methods because of pressure from stakeholders who value reliability over validity. More recently, however, Kolko (2015) finds that a shift towards design thinking is occurring within larger organisations. This shift is focused on applying the principles of design to the way in which people work to create a design-centric culture within an organisation, which removes design from its historical association with aesthetics and craft and instead elevates the role of design towards imparting a set of principles to all people who help bring ideas to life. This aligns with Brown (2009) who finds that larger companies are better positioned to drive innovation from a consumer-centred perspective that allows them to exploit assets that they already possess: a larger customer base, recognised and trusted brands, experienced customer service and support systems and wide distribution and supply chains.

Using design as a driver of innovation in this way aligns with Verganti's (2009) theory of design driven innovation, which indicates that organisations with strong innovation capabilities focus on the radical innovation of meanings, as opposed to technology push or market pull strategies. This theory postulates that people invest in the meanings behind products as much as they invest in the products themselves. Similarly, design plays an important role in incremental product innovation within organisations. This refers to the small changes in a product or service that help to improve performance, lower costs and enhance desirability to customers (Norman and Verganti, 2014). Most successful products undergo this process, which makes it a process just as important as radical innovation. It is an area in which the core of business operates and often most revenues are generated.

Aftab (2013) investigates design-driven innovation within the context of strategic level leadership and finds that in order for an organisation to develop propositions through design-driven innovation, the design function must be given equal influence alongside other core organisational functions as design cannot lead an organisation on its own. Consequently, in order for design to share leadership responsibilities with other disciplines, the organisation must recognise the impact that design can have on the organisation's overall strategy. Being design-led in this way requires a company to have a vision for top-line growth based on customer insights, however Bucolo *et al.* (2012) identify organisational leadership gaps as a key hurdle in reaching this strategic vision. Specifically, these leadership gaps have been identified in areas such as: engaging with customers, observation, problem framing and adapting mentalities. This raises questions about the qualities that are possessed by strategic level leaders that enable them to successfully champion design amongst other disciplines within an organisation.

In part, this difficulty stems from the extent to which design practice is built upon implicit and deeply held beliefs that are central to the nature of design knowledge; which is often intangible and tacit in nature, yet provides designers with the capability to propose novel solutions to complex problems. In particular, tacit knowledge is at the core of many design activities (Pugh, 1990; Casakin, 2007; Cross, 2006); however, the intangible nature of this knowledge makes it difficult for designers to articulate it in a way that can be recognised by other disciplines.

Design knowledge is part of a broader suite of competencies that are capable of explaining the uniqueness of design within multidisciplinary situations (Gribbin *et al.*, 2016a). One way in which knowledge can manifest in individuals is through their attitude, which culminates to form a working culture within an organisation or team. Existing design attitude literature highlights the differences that exist between designers and management professionals, however this literature does not presently consider the way in which these attitudes are impacted under the conditions brought about through multidisciplinary collaboration.

Design attitude

The notion of a design attitude was first brought about by Boland and Collopy (2004); who made a series of observations based on the learning process undertaken by a group of management practitioners during an architectural project. These observations led to the inception of two distinct types of attitude that appeared to be present over the course of the project; they were termed a design attitude and a decision attitude. The decision attitude is more prominent within management disciplines, where there is an underlying assumption that it is easy to generate solutions to a problem, however it is difficult to make the correct choice amongst these solutions. Prominent features of the decision attitude within the decision making process are fear of risk, high costs or inefficiency, all of which underpin the decisions of managers when faced with implementing solutions to problems.

Contrastingly, a design attitude is described as a unique mind-set and approach to problem solving that allows designers to shape inspiring and energising designs for products, services and processes that are both profitable and humanly satisfying. The design attitude takes an approach to problem solving that fundamentally believes that it is difficult to develop a good solution to a problem; however through the implementation of design processes, when a great solution is finally derived the decision about which solution to implement becomes arbitrary. In this sense, designers have awareness that the cost of not conceiving a better solution to a particular problem might be even more costly to an organisation than not making the correct choice in the first instance.

Michlewski (2008) builds on the proposition of design attitude by empirically investigating the determinants of design attitude within design-led organisations. It was determined that five theoretical categories could characterise design attitude within the participants of the study.

These categories are: consolidating multidimensional meanings, creating – bringing to life, embracing discontinuity and open-endedness, embracing personal and commercial empathy and engaging polysensorial aesthetics. In this respect, 'design is seen as a professional culture and a set of deeply held beliefs which offer a compelling picture of the professional culture of designers and their attitudes and values shaping their work' (Augsten *et al.*, 2016, p. 1533). Subsequently, these determinants of attitude underpin the values invoked by managers and scholars within the discipline and as such contribute to the working culture of organisations.

Much of the research thus far has taken a macro view of design attitude, investigating the impact that it has on organisational culture in companies where design-driven innovation is at the core of organisational thinking. A gap remains in the literature for research which analyses the impact that design attitude can have within a micro context, within the dynamics of teams and individuals, particularly in the interdisciplinary context in which various attitudes will have an impact on working practices. It is this gap that this paper aims to address.

Research methodology

This paper follows a research approach consistent with grounded theory, which has been combined with case study analysis in order to investigate design attitude within a particular context. Grounded theory itself is a systematic generation of theory from data that has been obtained from social research (Glaser *in* Hussein *et al.*, 2014). It is an inductive method of generating theory through the simultaneous collection and analysis of data, with the goal of generating relevant and significant knowledge through social research. Within this paper, the goal of grounded theory was to generate fresh insights into the findings of an existing case study.

Yin (2014) identifies that case study research is a method of empirical enquiry that investigates a contemporary phenomenon in depth and within its real-world context; particularly when the boundaries between phenomenon and context may not be clearly evident. Similar to grounded theory, cases provide an opportunity to explore propositions and generate theory from the resulting data. Grounded theory is often limited in terms of its generalisability with theories often only relevant to the context in which they are derived (Stebbins, 2001). Combining it with case study research appears to mitigate the effects of this issue, as the use of cases begins to provide examples derived from multiple experiments that investigate phenomena through different perspectives (Lipset *et al.*, 1956; Hammersley *et al.*, 2000; Johansson, 2003).

Case selection

The case study itself is the result of a collaboration between Organisation A and a UK based University. Organisation A is a multinational consumer goods company that focuses on the production of health, hygiene and home products. The organisation has a series of brands that are available in nearly 200 countries, with several brands capable of being described as brand leaders in their respective markets. Innovation is at the core of the organisation, with the company describing a relentless strategy of creating innovative solutions to people's everyday challenges in health, hygiene and home, through high impact, consumer-led research. The organisation is driven by both technology and a consumer-focus in creating new products that are capable of improving the lives of their consumers.

Organisation A initially approached the University in order to collaborate on a packaging focused project with students of an undergraduate course. Upon completion of this project, the organisation then decided that it wished to carry out further work with the University. A subsequent project was carried out by a postgraduate programme and forms the focus of this particular case study. The postgraduate course is based on the philosophy that design-led innovation has the potential to redefine the way that we live, do business and create our future. To achieve this, a collaborative and multidisciplinary environment is created in which students work together in small teams on a range of commercial and social innovation projects with external organisations.

The primary aim of the project determined by Company A was to investigate compliance issues surrounding non-prescription painkillers in the pharmaceutical marketplace. The client had identified issues surrounding consumer engagement with product packaging and instructions, with a particular focus on issues surrounding people discarding the packaging of over the counter medications before reading instructions. Furthermore, the clients had predicted that a market shift towards technology-focused interactions with consumers was forthcoming, therefore it was also requested that the students aim to incorporate a future-technology driven focus within their research and ideation processes.

The student team that were working on the project consisted of six students from a range of backgrounds and experiences, a summary of which can be found in Table 1. Each student has been given a code that is used to reflect their discipline throughout the discussion section of the paper, with DG indicating graduates from a design background and BG indicating graduates from a business background (Table 1).

The student project team was supplemented by the advice of various lecturers from the University. Regular meetings were held with lecturers from design, business and technology disciplines, with further access to professionals throughout the University available when needed.

Subordinate methods

Within the spirit of case study research, Eisenhardt (1989) highlights that multiple methods of data collection are often utilised, which may be qualitative or quantitative in nature. Within this study the primary data collected was qualitative and collected through observation and reflective interviews. The project itself lasted for a duration of six weeks in which the researcher observed the students throughout the key stages of the project.

Upon completion of the project, two additional research methods were implemented. Firstly, a workshop was carried out with the students, with the goal of encouraging reflection. The workshop commenced with the stu-

Table 1. Students and their backgrounds and experiences.

Student/code	Background and experience
1 (DG)	Four year industrial design degree programme working on a range of projects for multinational clients. Additionally completed a four month placement at a design consultancy.
2 (BG)	French with business graduate. Self-described entrepreneur having established an online start-up business.
3 (BG)	Educated in biomedical science and food science before becoming a management trainee and product developer in a FMCG company, with 2.5 years training in different areas of the organisation.
4 (BG)	A business management graduate with experience in the cosmetic industry following graduation.
5 (DG)	An undergraduate degree in design and fashion, with a further three years working as a marketing professional for the outdoor brand Berghaus.
6 (BG)	A business leadership and corporate management graduate, with experience in a marketing focused freelance consulting role.

dents documenting a timeline of the project to provide a template for the workshop questions. Wording of the workshop questions was critically important in gaining as full a response as possible without offering solutions or leading the students in any way. In determining the skills and capabilities that were used throughout the project, students were asked to use the timeline to write down the corresponding skills that they felt they used at each stage of the project. Students were then asked to rank the skills that they improved most throughout the project, to determine which skills were present before the project and which were specifically developed throughout the project. In order to determine the knowledge utilised throughout the project, the students were asked to choose three key decisions that they made throughout the project and then explain the knowledge that underpinned these choices. This allowed them to ground the notion of knowledge within a context that was easier for them to understand, instead of asking them to explain the knowledge that they drew from throughout the project. Finally, participants were asked about the aspects of the projects that they found stimulating and the aspects that they found irritating.

Following the workshop, each of the students was interviewed using the repertory grid method. A repertory grid is a method for eliciting personal constructs in relation to a given topic. The method was derived by Kelly (1955); who expressed that people are continually engaged in the process of devising new theories, testing hypotheses based on these theories and acting on their findings (Giles, 2002). Kelly (1955) described this process as personal construct theory, arguing that individuals construct rational worlds based on their experiences, which shape a pattern that can be defined as 'personal constructs'. Candy (1990) describes a system of personal constructs as a repository of what a person has learned, a statement of their intent and the values by which they live. As a person builds up their construction of reality, more and more constructs are derived until eventually a complex and unique picture of one's reality is formed; thus demonstrating the way in which a person organises their social world, which is then open to interpretation. Within the context of this research, repertory grid based interviews afforded the students the opportunity to reflect on their project in a way that aided the understanding of the beliefs and assumptions that underpinned their decision making over the course of the project (Gribbin *et al.*, 2016b); thereby revealing more of the attitudes and aspects of the tacit knowledge that they had applied.

Discussion

Work seeking to understand the uniqueness of designers within multidisciplinary scenarios has generated several insights that are applied to designers in general. Further categorisation has occurred specifically within the design attitude literature, with Michlewski (2008) discussing several categories of design attitude that were pertinent throughout interviews with design professionals. Despite this research, there has been little discussion focusing on the interactions between design and other disciplines.

This section of the paper seeks to broaden the thinking in this area, by offering a statement that is generated from relevant theory, before discussing the occurrence of each statement as observed within the case study. The studies referenced within the discussion of each statement are a mix of evidence based studies and reflective propositions based on design practice. The evidence-based studies add credibility to the statements at this stage, however a further aim of this research is to add further evidence in documenting these claims.

Abductive reasoning is at the core of design thinking

Within design thinking, it is recognised that particular emphasis is often placed on the process of finding the right problem to focus on, through understanding the needs of markets and individuals as well as identifying future trends that can have an impact on the problem. Goel and Pirolli (1989) highlight that because of the ill-structured and complex nature of design problems, they require the problem solver to engage in an extensive problem structuring process. Michlewski (2008) refers to this as the consolidation of multidimensional meanings, in which designers have the ability to look at

a situation from a wide variety of perspectives, bringing a humanistic standpoint to problem solving. Tomiyama *et al*. (2003) suggest that creative design primarily stems from an innovative combination of existing knowledge, where abductive reasoning is central to integrating knowledge in particular circumstances.

Dorst (2011) suggests that designers tend to have deliberate strategies in order to tackle the creative challenge presented by particular problems, in which designers adopt a frame that can be applied to working principles in order to create specific values. Kolko (2010) highlights that this process of framing through the consolidation of meanings is typically one of the reasons that other disciplines can often fail to understand the processes of designers. When encountered in professional practice, Kolko (2010) suggests that the synthesis process is frequently performed privately with only the outcome being observed by onlookers, with this specifically occurring after the synthesis process has occurred and the form-making portion of the design process has begun. Synthesis is described as an insular activity that is less obviously understood or alternatively completely hidden from view.

Within this particular project, the students that were not from design backgrounds did not face this level of uncertainty within the problem framing and synthesis aspects of the project. In particular, the proportion of time that students spent on research throughout the project demonstrates that they valued highly the process of problem framing. This was echoed in the reflective workshop, where student 5 (DG) identified the research work done throughout the project as particularly important in defining the question. Student 3 (BG) echoed this, suggesting that the converging stages of the project were the most important, in which the team engaged in the process of problem framing based on their extensive research. All of the students followed an empathic, user-focused discovery process in which they set out to understand the problems that faced a variety of target consumers.

As part of the repertory grid interview, student 3 (BG) stated that they found certain aspects of the project difficult due to a feeling that they were not particularly contributing at certain stages of it. When questioned further on this, they were able to articulate that they found difficulty in stages of the project that were particularly divergent. Despite this, they felt that their biggest input into the project was during the problem framing stage, where their research skills and critical thinking in order to successfully synthesise findings were particularly important. This highlights that even a student who found difficulty in following certain aspects of the design process was able to have a large input into the problem framing stage, adopting a similar thought process to those that were more familiar with design practices.

Embracing discontinuity and open-endedness

One of the key features of design problems is that they are ambiguous and often stem from ill-defined requirements (Jonassen, 2000). Throughout the design-led problem solving process, there are multiple solution paths that can lead to a variety of end products (Lammi and Becker, 2013). Designers relish the lack of predetermined outcomes and they tend to approach new projects with a desire to experiment with materials, technologies and methods and to do something different and better than ever before. To do this, designers must work creatively within the established boundaries of a project and each project must be approached with a desire to experiment and do something unique and better than ever before (Carlopio, 2010).

Dealing with ambiguity within the project was an area in which the majority of students from a business background struggled. This was particularly evident in the early stages of the project where the students were only given a small amount of information with regards to the official brief. Students 3 (BG), 4 (BG), 5 (DG) and 6 (BG) particularly struggled with this aspect of the project, to the point that at one stage they were willing to temporarily halt working on the project until they were presented with a more in depth brief by the client. When questioned, this hesitancy stemmed from the fact that the students were used to situations within industry where they were given defined briefs and operated in a specific manner to solve the problems. Student 6 (BG) found this process particularly frustrating, expressing that it was difficult to work from a position in which the client expectations were not explicit. Contrastingly, student 1 expressed that ambiguous briefs had been common in their experience of design projects and that it was something that they were used to dealing with. Similarly, student 2 (BG) also expressed that they were comfortable working in ambiguous situations, primarily because they were used to working in this way on previous projects; however it is also important to note that student 2 (BG) has less experience working within industry situations and as a result is perhaps more open to new ways of working which would then become a norm.

From this, it appears that dealing with ambiguity within projects is something that sets designers apart from other disciplines and that it also requires a way of thinking that can be difficult to adopt for people that are not used to working in this way. It appears particularly difficult for people who are used to working on specific projects with plentiful information available at the outset to adopt a mindset that allows them to work in situations that they find ambiguous, whereas if people have experience in these types of situations they become more comfortable with the approach. Given the experiences of the business-based students, these situations do not appear to be common within the management roles that were held prior to the beginning of the programme. Furthermore, it appears that by spending time within a business-focused role, student 5 (DG) became accustomed to well defined briefs and struggled with the transition back towards ambiguous problem situations.

Creating, bringing to life

Yoo *et al*. (2006) express that form giving is essential to projecting a design identity into the world through ongoing design activity, projecting custom solutions to products or services that are capable of releasing new experiences into the marketplace. Smets *et al.* (1994) expand on this by demonstrating that designers have powerful abilities to convey complex, non-obvious information

using shape and colour. Junginger (2007) suggests that to achieve good design, designers must now be involved with a systematic inquiry beyond aesthetics and functions, however engaging in sketching, prototyping, testing, evaluating and refining ideas in two or three dimensional form all involve the process of translating ideas into actions which remain at the core of design activity.

Content analysis carried out on the workshop data indicated several activities carried out over the course of the project that can be associated with the process of bringing ideas to life. The students articulated skills in prototyping, storyboarding, video editing, 3D rendering, animation and persona creation that were consistent with this category. In terms of the distribution of these tasks, the engagement of business students varied. Students 2 (BG) and 6 (BG) played a large role in this process, particularly towards the end of the project when the team was tasked with creating more elaborate prototypes of their final concepts and creating videos that were capable of communicating the benefits of their ideas to the clients. In this respect, the two students adopted the culture of design making and largely participated in what would typically be considered as a design task. The primary difference between these two students and student 1 (DG) in this instance, was that student 1 (DG) possessed the necessary design skills to carry out more complex activities involved in the prototyping of ideas. This was particularly evident given student 1's proficiency in creating 3D renders of concepts and using more advanced physical prototyping methods, which had been explicitly developed through formal design training.

To a smaller extent student 5 (DG), engaged with the process through acts of sketching, however in comparison to students 2 (BG) and 6 (BG) this contribution was minimal. To an even greater extent, students 3 (BG) and 4 (BG) particularly struggled with this element of the project. Student 3 (BG) expressed that they felt like they were not able to contribute to this process at all due to a lack of an ability to draw particularly well. This suggests that in order for business oriented people to engage with a design attitude when it is necessary to bring ideas to life, a confidence in a person's own ability to draw and visualise concepts through sketching is the minimum requirement for people to feel engaged with the process.

Attitudes toward concept selection

As previously highlighted, Boland and Collopy (2004) discuss the differences between design and management disciplines in terms of decision making during the problem solving process. Those with a decision attitude were seen to struggle with concept selection decisions due to a fear of risk, whilst those with a design attitude were more comfortable in concept selection based on an inherent belief in the concept inception process. The contrast between design and decision attitude was particularly evident within the project when students were in the process of synthesising their ideas in order to determine which had the most value to their work. The students settled on a decision matrix that allowed them to score their ideas in terms of value to the client and also the consumers. Once the students had scored what they perceived to be their strongest ideas, there was a disagreement as to whether the remaining ideas should also be scored. Student 1 (DG) felt that this process would be a waste of time at this stage of the project and that the ideas currently in line to go forward were the strongest available to the team. Conversely, students 3 (BG) and 4 (BG) felt that it was necessary to score the remaining ideas to be sure that the strongest ideas actually went forward for selection.

This instance demonstrated opposing differences between people of different backgrounds almost exactly as described within the literature. Students 3 (BG) and 4 (BG) felt that it was particularly difficult to choose between solutions at this stage and exhibited a fear of making the incorrect choice at this stage of the process. They felt that it was risky to develop the concepts that had been ranked without first ranking every single idea that the team had because they feared making the wrong selection at this stage. Conversely, student 1 (DG) felt that at this stage the best concepts were obvious because they were the really great solutions that met the needs of consumers outlined in the extensive problem framing process. Subsequently, it appears that attitudes towards risk are something that differs strongly even within multidisciplinary collaboration. Those from business backgrounds were more risk adverse at this stage of the project, whereas the designer was less concerned with risk at this stage due to an inherent belief in the working processes of the team.

Conclusion

An increase in design management literature has seen various strands of research that seek to explicate the knowledge offered by designers within the context of multidisciplinary situations. Despite this, the intangible nature of design can make this a difficult endeavour. In attempting to explicate some of the factors that underpin the success of design, authors such as Boland and Collopy (2004) and Michlewski (2008) have attempted to understand the attitudes of designers and the relevance of this in creating an organisational culture that is conductive of strong design principles in the problem solving process. Whilst this literature is conclusive in suggesting the attitudes of designers, it does not presently consider the relationship between attitudes within a multidisciplinary context. This paper has aimed to address this gap, by examining the attitudes of designers and business people within the context of a postgraduate collaborative project.

It was found that business students were capable of engaging with the abductive reasoning that underpins the traditional design thinking process, which was somewhat surprising given existing literature's suggestion that the abductive logic can often be hard for people to follow due to its intangible nature. Furthermore, it was found that business and design share similarities in the process of bringing things to life, however these similarities were dependent on the extent to which business students felt confident in processes such as sketching. Where students felt that they lacked this proficiency, they struggled in their ability to adopt this way of thinking and impact this area of the project.

One of the primary differences between the two disciplines was the attitude towards risk during the concept

selection stage of the project. Business students displayed the attributes of a decision attitude in that they were risk adverse in selecting concepts, however the designers did not reciprocate this view due to an underlying belief in the application of the design process. Furthermore, dealing with ambiguity also proved to be a dividing factor between the two disciplines, with the business students finding this aspect of the project particularly difficult to navigate, whereas the design student thrived under those conditions voicing an enjoyment of the project brief.

Limitations

The study faces limitations in the fact that it takes an in-depth view into a single study as opposed to a broader view of multiple cases. As such, it is difficult to generalise the results beyond their application within future student projects at this juncture. As such, a replication of the study with a larger sample and access to more disciplines would be necessary to further this research in the future, which would add further validity to the findings.

Implications

The research has implications for both professional practice and on going research into multidisciplinary practice. By exposing aspects of the design attitude that are relatable to people from business backgrounds, the research perhaps offers a fresh perspective for designers dealing with the task of communicating their practice to people from different disciplines. It has the potential to make aspects such as the problem framing process more explicit in these discussions, in the knowledge that it will be made relatable to people from business backgrounds. Furthermore, the work highlights aspects of attitudes such as dealing with ambiguity and concept selection as aspects of work to which designers bring a unique perspective, thus adding extra value to this stage of the problem solving process.

For future research, the research methods of the study appear to be particularly relevant to capturing attitudes within a professional context. A mixed method approach of observation, reflective workshops and repertory grid interviews allowed a collection of data that was reliable given the similarities in the data collected through each method. Observation allowed an independent researcher to capture data within the context of the collaborative project, whilst the workshop and repertory grid interviews allowed the students to reflect on their practice at a deeper level consistent with double-loop reflective practice (Argyris, 1976); in order to understand their beliefs and attitudes that are intrinsic to their working practices and articulate these in a way which would not have been possible through alternative methods.

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